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EXAMINER

CHEN, TIANJIE

ART UNIT PAPER NUMBER

2652

DATE MAILED: 06/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/613,559

Applicant(s)

GILL, HARDAYAL SINGH

Examiner

Tianjie Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-23 and 25-34 is/are rejected.
- 7) ☒ Claim(s) 9 and 24 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 07/20/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

Non-Final Rejection

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 7 and 22 are objected to since the term "high" in claims 7 and 22 is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 7, 8, 10, 12, 14-17, and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Pinarbasi (US 2003/0179513).

Claim 1, Pinarbasi shows a magnetic head in Fig. 10, including: a free layer 202; an antiferromagnetic layer 216 spaced apart from the free layer; and an antiparallel (AP) pinned layer structure 204 positioned between the free layer and the

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antiferromagnetic layer and having a net magnetic moment equal to about zero (for the two layers have same thickness; see [0044] lines 13-15 and [0058] lines 10-17); wherein the AP pinned layer structure includes antiparallel pinned layers 510 and 512 that are pinned through large magnetic anisotropy due to positive magnetostriction and small net moment for the antiparallel pinned layers ([0011]); wherein the antiferromagnetic layer provides a coercivity that enhances pinning of the AP pinned layer structure ([0011] and [0012]).

Claim 7, Pinarbasi shows the antiferromagnetic layer is made of PtMn, which is the same material as used in this Application, which inherits a high positive magnetostriction.

Claim 8, Pinarbasi also shows that the AP pinned layer structure includes at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other, the pinned layers being separated by an AP coupling layer ([0016] and [0043]).

Claim 10, Pinarbasi also shows that the magnetic anisotropy of the AP pinned layer structure is oriented perpendicular to an ABS of the reading head ([0016]).

Claim 12, Pinarbasi further shows an in-stack bias layer 240, the bias layer stabilizing the free layer, the AP pinned layer structure stabilizing the in-stack bias layer ([0046]).

Claim 14, Pinarbasi shows that the head forms part of a GMR head.

Claims 15-17, Pinarbasi further shows that the head forms part of a CPP/or CIP/or tunnel junction sensor ([0064]).

Claim 33, Pinarbasi further shows a magnetic storage system in Figs 1-7 including: magnetic media; at least one head for reading from and writing to the

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magnetic media, each head having: a sensor having the structure described above, a write element coupled to the sensor; a slider for supporting the head; and a control unit coupled to the head for controlling operation of the head.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 2-6, 11, 13, 18-23, 25-32, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinarbasi.

Claims 4 and 5, Pinarbasi shows that the antiferromagnetic layer is constructed of PtMn having an exemplary thickness of 30 Å, it implies that the thickness is variable. Pinarbasi also shows a thickness of the antiferromagnetic layer 332. which has a thickness of 150 Å. It would have been obvious at the time the invention was made to one of ordinary skill in the art to choose a suitable thickness through experimentation, which would include the range of between about 50 Å and 100 Å / or 60 Å and 90 Å.

Claims 18 and 21, as described above, Pinarbasi shows a magnetic head, including: a free layer, an antiferromagnetic layer spaced apart from the free layer, the antiferromagnetic layer being constructed of PtMn having a thickness of between about 50 Å and 100 Å /or 60 Å and 90 Å; and an antiparallel (AP) pinned layer structure positioned between the free layer and the antiferromagnetic layer, wherein

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the AP pinned layer structure includes at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other through large magnetic anisotropy due to positive magnetostriction and a small net moment for the antiparallel pinned layers, the pinned layers being separated by an AP coupling layer; wherein the antiferromagnetic layer provides a coercivity that enhances pinning of the AP pinned layer structure.

Claims 2, 3, 6, 19, and 20; Pinarbasi shows the antiferromagnetic layer, which is made of PtMn, which is the same as disclosed in this Application; therefore, it should inherit a coercivity of at least about 300/400 Oe.

Claims 11 and 26, Pinarbasi shows a head as described above, does not specifically shows that the head is adapted to read from media having a bit density of at least about 200 Gbit/in.

However, applicant claims that his head is adapted to read from media having a bit density of at least about 200 Gbit/in without disclosing particular features directly for reaching this specific density. Pinarbasi shows a head having same structure as described above. One of ordinary skill in the art would have been reasonably expect that can also be adapted to read from media having a bit density of at least about 200 Gbit/in.

Claim 22, as described above, Pinarbasi shows that the antiferromagnetic layer has a high positive magnetostriction.

Claim 23, Pinarbasi further shows that in Fig. 10 that the pinned layers are constructed of at least CoFe and the AP coupling layer is constructed of at least Ru.

Claim 25, as described above, Pinarbasi shows that the magnetic anisotropy of the AP pinned layer structure is oriented perpendicular to an ABS of the reading head.

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Claim 27, as described above, Pinarbasi shows that the head includes an in-stack bias layer, the bias layer stabilizing the free layer, the AP pinned layer structure stabilizing the in- stack bias layer.

Claims 29-32, Pinarbasi further shows a head as recited in claim 18, wherein the head forms part of a GMR head/CPP/CIP/tunnel junction sensor ([0064]).

Claim 34, Pinarbasi shows in Figs. 1-7 a magnetic storage system, including: magnetic media; at least one head for reading from and writing to the magnetic media, each head having: a sensor having the structure as described above, a write element coupled to the sensor; a slider for supporting the head; and a control unit coupled to the head for controlling operation of the head.

Claims 13 and 28, Pinarbasi shows in Fig 9 a head including a bias layer 140 formed along a track edge of the head, the bias layer stabilizing the free layer.

Applicant also does not disclose any advantage of using this bias and only discloses as an alternative. It would have been obvious at the time the invention was made to one of ordinary skill in the art to includes bias as an alternative; it has some disadvantage, but is not excluded.

Allowable Subject Matter

4. Claims 9 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

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- With regard to claims 9 and 14, as the closest reference, US 2003/0179513 to Pinarbasi shows a magnetic head including: a free layer; an antiferromagnetic layer; and an antiparallel (AP) pinned layer structure positioned between the fret layer and the antiferromagnetic layer, and having a net magnetic moment equal to about zero (for the two layers have same thickness; see [0044] lines 13-15 and [0058] lines 10-17); wherein the AP pinned layer structure includes antiparallel pinned layers separated by an AP coupling layer; **but fails to show** that the thicknesses of the AP coupling layer and thicknesses of the pinned layers are selected to provide a pinned layer saturation field of at least 5 KOe.
- Applicant asserts: this new structure provides good pinning of the pinned layer and prevents flipping of the magnetic orientations of the AP pinned layers (Specification, p. 11, lines 15-16).

Conclusion


5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tianjie Chen whose telephone number is 571-272-7570. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on 571-272-7579. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


TIANJIE CHEN
PRIMARY EXAMINER